Long-term Archive of the DUCK94 Nearshore Field Experiment Data

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LONG-TERM GOALS

The long-term goal of this effort is to compile and distribute data collected during the DUCK94 and SandyDuck'97 nearshore field experiments so that these data may be accessed by researchers worldwide.

OBJECTIVES

Conducted in August, September, and October 1994, DUCK94 was an intense, large-scale, multi-agency investigation of surf zone winds, waves, currents, sediment transport, and morphology

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within a 1 x 0.5 km region at the U.S. Army Corps of Engineers Field Research Facility (FRF) in Duck, North Carolina. DUCK94, which was a pilot for the SandyDuck '97 experiment, included 31 investigations of varying complexity, using a variety of instruments. SandyDuck included 30 experiments (see attached Tables 1 and 2). The data collected by each experiment currently reside with the associated principal investigators. Summaries of what data were collected exist, but there is no central database and no easy public access to the data. Because these experiments occurred during strikingly different conditions and since they resulted in the two most comprehensive observations of nearshore dynamics ever collected, the data have great potential for fundamentally advancing nearshore science with direct application to Navy and US Army Corps of Engineers modeling efforts.

By agreement it was resolved that experimenters' data would become publicly available three years after the completion of each experiment (1998 for DUCK94; 2001 for SandyDuck). The purpose of this project is to begin a multi-year effort to make these data available online and in useful formats.

APPROACH

The DUCK94/SandyDuck data include a wide variety of data types stored by the individual investigators in many different formats on a network of widely distributed computers and media. Some data sets are of wide general interest, many are not. Some of the data will be thoroughly described and quality controlled, much will not be. As the data are used in more and more research projects it will continue to be refined and better understood. Because of these considerations, we have adopted and adapted a UNIX/web based data management system originally developed for the Joint Global Ocean Flux Study *(JGOFS).* It has several features that make it desirable to this application. These are:

> The data server already exists, is freely available, customizable, and easy to administer. It is web based and easy for unfamiliar users to navigate, includes documentation pages, screen display and plotting, data searches, and links to ftp site files for direct downloading.
>
> Data can reside on the original investigator's computer system so users always access the most recent version, or it can be moved to a central server.
>
> Data can remain in its original format and be translated and delivered to each user when requested, or it can be translated once.

The JGOFS server software does have limitations. Because of Internet security concerns, it is no longer practical to expect each investigator to maintain a web server to allow access to their data. Consequently we are adapting the system to use a single server for the data. While this negates one of the original attractions, that users would always access the most recent version of the data, we expect DUCK94 data to be well analyzed and to require little if any future editing. Moving most of the data to a common server insures that the data remain online, even as interest by the collecting investigators wanes. We have also decided to translate the original data to a common format. Translated files are columnar ASCII files which are MATLAB and spreadsheet compatible, making them easy to use by most users. This also allows us to standardize the format of similar data collected by different investigators (mean current statistics, wave height measurements, etc.).

DUCK94/SandyDuck data can be broadly classified as four types:

Table 1. DUCK94 Experiments

No.	Investigators	Experiment Title	Participating Months	Wave Shoaling	Nearshore Circulation	Boundary Layers	Swash Processes	Small Scale Sediments	Meso/Macro Morphology	Water Properties
1	Beach, Holman, Sternberg	Sediment dynamics in the nearshore environment	Aug,Oct		X	X		X		
3	Church, Elgar, Guza	Mine scour, burial, and migration as a function of wave and current forcing	Sep				X			
4	Drake, Smith	Nearshore sedimentary structures	Aug,Oct					X		
5	Dugan	Airborne remote sensing of the environment in the littoral zone	Oct	X	X					
6	Earle	Real-time buoy directional wave measurements for driving surf zone numerical models	Aug,Oct	X						
7	Earle, Walsh, Boyd	Scanning radar altimeter sea surface topography & high resolution directional wave measurements	Oct	X						
8	Elgar	Temporal and spatial variability of the bathymetry of a natural beach	Aug,Oct						X	
10	Graber, Shay, Haus	An investigation of surface currents and internal waves over the inner and mid-shelf	Oct	X	X					
11	**Elgar, Herbers, Guza, O'Reilly**	**Surface gravity waves and nearshore circulation**	**Aug,Oct**	**X**	**X**					
12	Haines, Gelfenbaum	Vertical structure of mean currents & turbulent stresses in the nearshore boundary layer	Aug,Oct		X	X				
13	Hanes, Vincent	Near bed intermittent suspension	Aug,Oct		X			X		
14	Hanes	Remote video measurement of mesoscale nearshore processes	Aug,Oct				X		X	
15	Hathaway	Rip current mapping	Aug,Oct		X				X	
16	Hay, Bowen	Sediment suspension, local morphology, and bubbles	Oct		X			X	X	X
17	Holman, Holland, Plant	Foreshore dynamics	Aug,Oct				X			
18	Howd, Hathaway	Processes of shoreface profile adjustment	Aug,Oct		X				X	
19	Jensen	Evolution of wave spectra in shallow water	Aug,Oct	X						
20	Lippmann, Thornton, Stanton, Su	Spatial distribution of wave breaking and turbulence	Aug,Oct	X		X				X
21	Long	Wind wave frequency-direction spectral measurements	Aug,Oct	X						
22	Miller	Longshore sediment transport during storms	Aug,Oct					X		
23	Fabre, Wilson, Earle	Wave and surf generated ambient noise measurements	Aug,Oct							X
24	Stauble, Smith, Birkemeier	Sediment dynamics and profile interactions sampling experiment	Aug,Oct					X		
25	Thornton, Dingler	Small-scale morphology in the nearshore	Aug,Oct					X	X	
26	Thornton, Stanton	Suspended and bedload sediment transport	Aug,Oct		X			X		
27	Trizna	Radar remote sensing of nearshore processes: bar morphology, directional wave spectra, infragravity waves, wave breaking	Aug,Oct	X	X				X	
28	Walker	Hyperspectral optical characterization of surf zone bottom/resuspended sediment	Aug					X		X
29	Werner, Elgar	Swash zone morphology: field manipulation and simulation	Jun,Sep				X		X	
30	White	Field tests of sediment transport theories	Aug,Oct		X			X		
31	Livingston, Wolf, Pasewark	Wave and surf noise measurements: supplementation	Oct							X
	Field Research Facility	**Basic environmental meteorlogical and oceanographic measurements**	**Aug-Oct**	**X**	**X**				**X**	**X**

Table 2. SandyDuck Experiments			Wave Shoaling	Nearshore Circulation	Boundary Layers	Swash Processes	Small Scale Sediments	Meso/Macro Morphology	Water Properties
No.	Investigators	Experiment Title							
1	Beach, Holman, Sternberg, Ogston, Conley	Fluid-sediment interactions in the surf zone		X	X		X		
2	Drake, Snyder	Side-scan sonar studies of nearshore morphology in the vicinity of Duck, NC						X	
3	Dugan	Nearshore measurements for long-range remote sensing		X				X	
4	Edson	Application of a marine surface layer model to the Coastal Environment			X				
5	Elgar , Herbers, O'Reilly, Guza	Surf zone waves currents and morphology	X	X		X		X	
6	Friedrichs, Brubaker, Wright, Vincent	Cross-shoreface suspended sediment: a response to the intersection of nearshore and shelf processes		X	X		X		
7	Haines, Gelfenbaum, Wilson	Vertical structure, bedforms, turbulence		X	X		X		
8	Hanes,Vincent	Near bed intermittent suspension		X			X		
9	Hay, Bowen, Doering, Zedel	Nearshore sediment dynamics: suspension, bedforms, and bubbles		X	X		X		X
10	Heitmeyer	Surf-noise experiment							X
11	Herbers, O'Reilly, Guza	Wave propagation across the continental shelf	X						
12	Holland, Sallenger	Swash zone morphology				X			
13	Holman	Large scale morphology						X	
14	Howd, Beavers	Geologic signature of storm events on the inner continental shelf and outer surf zone						X	
15	Howd, Hathaway	Shoreface processes and bed response	X	X				X	
16	Jensen	Evolution of wave spectra in shallow water	X						
17	Jol	Ground penetrating radar of the beach						X	
18	Lippmann	Observations of nearshore wave breaking, whitecapping, and large scale sand bar morphology	X		X				
19	List	Regional shoreline change						X	
20	Long	Wind wave frequency-direction spectral measurements	X						
21	Miller, Resio	Sediment transport rates during storms		X	X		X		
22	Sallenger	Coastal applications of scanning airborne laser (LIDAR)						X	
23	Smith	Observations of waves and currents near the surf zone	X	X					
24	Su, Teague	Coastal breaking wave and bubble measurements							X
25	Svendsen, Grosskopf	Models of nearshore circulation	X	X					
26	Thornton, Stanton	Nearshore wave & sediment processes	X	X	X		X		
27	Trizna, Kirby	Experimental tests of Boussinesq wave models in the near surf zone	X	X					
28	Trizna	Marine radar remote sensing of bar & rip morphology						X	
29	Trowbridge	Measurement of bottom stress in the wind- and wave-forced nearshore environment	X	X	X				
30	Wu, Shih, Kobayashi	Nearshore water level profiles during storms	X						X

1. Discrete time series samples from single-channel sensors (current component, pressure, optical backscatterance, sonic altimetry, temperature, wind speed, wind direction, etc.), usually recorded in the form of voltage analogs convertible to physical units through calibration coefficients. Summary statistics in physical units are usually computed from the time series data.

2. Time sequences of one- or two-dimensional results (video-derived runup, benthic surveys, beach surveys, frequency-direction wind-wave spectra, contours of side-scan sonar images) derived by specialized processing of more rudimentary data.

3. Digital image data (camera snapshots, time-averaged images, movie loops of various processes).

4. Analyzed sediment samples, which include size distribution and composition described in text and tables, and photographs and x-ray images of core peels archived as digital images.

Not all of these types are efficiently handled by this JGOFS based system, so we plan to use other web tools such as FTP and static web pages to deliver those data types .

Key to the success of this effort is cooperation from the investigators to provide: online access to their data; complete information about the filenames and data formats, and thorough descriptions of the data including how it was collected, what manipulation was conducted and any quality concerns. Initial response has been positive with many investigators ready to provide their data.

WORK COMPLETED

The goal of the first period of effort was to evaluate, implement, and adapt the JGOFS system to our use and to include two primary DUCK94 data sets (bolded in Table 1). Data collected by the Field Research Facility, which is used by all experiments as background information, and data collected by the team of Elgar, Herbers, Guza, and O'Reilly. These data sets have been translated to the columnar ASCII format and included in the server database along with documentation to assist in the interpretation of these data sets. Only a few minor modifications are required before the data server will be linked to the FRF web site at http://frf.usace.army.mil.

RESULTS

The JGOFS software was evaluated, tested, and a decision was made to utilize it as the server for statistical data. The server was installed at Elizabeth City State University and will become publically available during the fall 1999 providing the initial access to the data set. Feedback on the server's data accessability and presentation will be requested for future refinements. In subsequent years, additional data sets will be incorporated into the system until the archive is complete.

IMPACT/APPLICATIONS

By making the data available to researchers worldwide it will hopefully achieve maximum utilization getting the most out of these experiments for little additional money. In addition to making these data sets available to other researchers, it will also provide high quality data for students working on Masters or PhD degrees. Based on the research accomplished following earlier, less comprehensive FRF experiments, the DUCK94 and SandyDuck data will have wide use and great potential for advancing nearshore science.

TRANSITIONS

A presentation at the Fall AGU conference, an international conference for the American Geophysical Union, will announce the availability of the data and demonstrate how it can be acquired.

RELATED PROJECTS

It is expected that what is learned from implementing this server will provide an improved method to deliver the 20 year archive of FRF data in addition to the DUCK94 and SandyDuck experiment data.

REFERENCES

To learn more about the JGOFS data server system see http://www1.whoi.edu/jg/dir/jgofs/